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Design Research is Alive and Kicking...

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Abstract: This paper explores the current situation of design research with a particular emphasis on how emerging forms of design research are framing and addressing contemporary global issues. The paper examines how design research can be a creative and transformative force in helping to shape our lives in more responsible, sustainable, and meaningful ways. Today, the plurality in design research is clearly evident given the wide range of conceptual, methodological, technological and theoretical approaches adopted. Moreover, various forms of design research now routinely appear in a vast array of disciplines in and around modern design praxis, including business, engineering, computing, and healthcare. This paper reviews a rich selection of the state-of-the-art design research that exemplify the range of approaches, methods, applications, and collaborations prevalent in emerging forms of design research and presents 10 characteristics of 'good' design research that will support design researchers in addressing the complex global issues we face.

Keywords: design research; practice; interdisciplinary, plurality

1. Introduction

This paper explores the current situation of design research with a particular emphasis on how emerging forms of design research are framing and addressing contemporary global issues. The paper examines how design research can be a creative and transformative force in helping to shape our lives in more responsible, sustainable, meaningful, and valuable ways. In fact it has been said that design is now the best tool we have available to us in making sense of the increasingly complex situation we find ourselves in (Sudjic, 2009). In a similar vein a decade earlier, Nigel Cross claimed in his seminal paper *Design Research: A Disciplined Conversation* (Cross, 1999, p.5) that: "*Design research is alive and well, and living in an increasing number of places.*" Today, this plurality is clearly evident given the wide range of conceptual, methodological, technological and theoretical approaches in



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contemporary design research pursuits. Moreover, various forms of design research now routinely appear in a vast array of disciplines in and around modern design praxis, including business, engineering, computing, healthcare and management. Based on the authors' earlier work (Rodgers and Yee, 2015) and building on previous reviews of design research (Roth, 1999; Bayazit, 2004; Sevaldson, 2010), this paper seeks to determine the nature of contemporary and emerging forms of design research and propose future directions for how we might best cultivate it. As such, the paper reviews a rich selection of the state-of-the-art research 'into' (about), 'through' and 'for' design (Frayling, 1993) that exemplifies the wide range of approaches, methods, applications, and collaborations that are prevalent in current design research. In so doing, the paper will identify new emerging forms of design research and present 10 characteristics of 'good' design research that echo Dieter Ram's enduring 10 principles of good design.

2. A Recap of the Past 50 Years

Design research is now almost 50 years old. During this time, it has gone through considerable change and development. Reviewing the informal histories of design research, we can generally identify three major intellectual waves. The first wave (started in the 1960s) is sometimes referred to as 'Design Science' (Hubka and Eder, 1996) where researchers generally took a scientific approach to the study of design methods. Rittel (1972 cited in Bayazit, 2004) labels this embryonic phase as the 'First Generation Design Methods' movement. Much of this early design research was focused on studying and codifying design activities and processes and was largely dominated by the field of architecture, engineering and industrial design. Design research at this time mainly looked at 'rational methods of incorporating scientific techniques and knowledge into the design process to make rational decisions to adapt to the prevailing values, something that was not always easy to achieve. They were attempting to work out the rational criteria of decision making, and trying to optimize decisions' (Bayazit, 2004, p.19). Two of the leading figures in British design research movement around this time were Bruce Archer and John Chris Jones. They were among the organizers of the initial conference on design methods, which was held at Imperial College, London in 1962. Jones' motivation was to see designers working at higher levels of system and community design as well as making designers' methods more transparent, changing the common belief that design arose from a black box of inspiration. Archer was more flexible than some of his contemporaries in characterizing design as a practice that lay somewhere between science and art. Archer's establishment of the Industrial Design Research Unit at the RCA in the early 1960s was a major step forward for design research. Upon becoming the Department of Design Research, design research became a central feature in the RCA's other departments and in 1981 he published a seminal article in the proceedings of the 1980 conference, *Design: Science: Method*, which provided a long list of design research projects noted for their emphasis on products for special users rather than on consumer goods and for their attempts to deal with values, methodology and related issues.

The second wave came about in the 1970s as a reaction against the prescriptive nature of the earlier design methods movement. Horst Rittel criticised the first wave as simplistic, immature, and not capable of meeting the requirements of complex, real-world problems. At this time, Rittel introduced the term 'wicked problems' and argued that designers often face 'ill-formulated' and 'confusing' problems (Buchanan, 1992, p.15). Design researchers here posited that design should be understood through its own terms rather than through the lens of a positivistic approach – a model still dominant in the Sciences. Donald Schön, in particular, disputes this positivistic approach by arguing that design functions in situations of uncertainty, uniqueness, and conflict which makes it difficult to approach in a scientific manner. Schön challenges Simon's (1969) view that designing is based on well-formed problems, arguing instead that professional design practice has to deal with uncertain, ill-defined, complex, and incoherent problems (Schön, 1987). Instead, Schön proposes to search for "an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict" (Schön, 1983, p.49).

The founding of the Design Research Society (DRS) in 1976, with Bruce Archer as one of the original members, questioned how we should characterize design. Was it a science or something else? What made design knowledge unique and different from other kinds of knowledge? What constituted design knowledge and how could design be characterized as a discipline? All of these questions persisted at DRS conferences and were continued in *Design Studies*, the DRS journal that was founded in 1979. The move away from positivistic models and scientific approaches in design research has finally come full circle in the current third wave, where design is acknowledged as a distinct discipline, neither an art nor a science. Cross (2006) calls for a balanced approach to the development of a design discipline, on the one hand recognising that design has its own appropriate culture but on the other hand not completely disregarding other cultures. Cross terms this as a 'designerly way of knowing' and the current variety of types and forms of design research are evident of how far this idea has developed. Design research's recent past is littered with attempts to rationalise and articulate various approaches to define a range of design activities. But what does design research look like today and how might we best describe it?

3. Current Context

3.1 Research is Expected in the Academy

The number of designers pursuing postgraduate research programmes has been increasing since the late 1990s. This has happened for a number of reasons. The restructuring, national assessments and general academicisation of design research in the UK, Australia and Western Europe has led many Art and Design colleges to be merged or subsumed into large comprehensive multi-disciplinary universities (Melles, 2008). This has introduced a research dimension to the subject and an expectation of a research culture. It marks a paradigm shift in design education, especially in the UK. Research is now often more valued in teaching and

professional practice, and increasingly, a PhD qualification is the basic requirement for an academic post in higher education institutions around the world.

3.2 Research is Now a Key Skill in Professional Practice

This shift mentioned above has also coincided with growth and expansion of user-centred and participatory practices such as interaction, service and social design. These new practices in design require additional skills that are focused more on research, user studies and evaluation. The trend to use design as an innovation and a change management tool has also brought more scrutiny to the practice, requiring designers to be more transparent, open and co-operative in how they work. Unsurprisingly, the job title of 'design researcher' has begun to emerge in the last few years in design consultancies, businesses, government agencies, research institutions and policy organisations. A search on the LinkedIn.com site (in October 2015) using the term 'design researcher' returned 1,333 results featuring design-led companies like IDEO and Uber, large multi-national corporations like Yahoo and Samsung and technology companies like Microsoft, IBM and Facebook. While many of the job postings do not explicitly state a PhD qualification for the role, there is an expectation that whoever applies must be able to demonstrate familiarity with well-known research methods and have the ability to analyse and synthesise data and communicate findings in objective and compelling ways. These are all expected traits and training provided by a research degree. These jobs are the most direct representation and evidence of how academic research training can and is being used to inform professional practice in design. However, research for innovation is not just reliant on traditional quantitative and qualitative research but that it requires both "evidence and intuition; evidence to become informed, and intuition to inspire us in imagining and creating new and better possibilities" (Fulton-Suri, 2008, p.53).

4. What Does Design Research look like Today?

Having set the scene, we now move on to highlight trends that we have seen in recent design research projects, specifically focused on PhD studies and on occasions referring to funded research. The selection of the PhD projects included here is based on the authors' comprehensive survey of contemporary design research published recently (Rodgers and Yee, 2015).

4.1 New Topics of Inquiry and Applications

There are increasing numbers of studies focusing on service design, design thinking and social design, representing new practice areas for design (Yee et al, 2013). Recently completed PhD studies on service design (Warwick, 2015; Yu and Sangiorgi, 2014; Rao, 2012), design in social innovation and social design (Amatullo, 2015; Tan, 2012) demonstrates a growth of interest in these new areas of practice. There are also increasing studies exploring the realm of design as critical practice, most notably Matthew Malpass's study into the field of critical design in product design (2012) and more recently Tobie

Kerridge's PhD (2015) on role of speculative design in generating upstream public engagement in a science and technology context. Much of this research encompasses a political dimension that is intended to be both useful and impactful.

Laura Warwick's PhD (2015), for instance, explored how design can effect transformational change in a voluntary community sector (VCS). Her study reveals five organisational factors that are critical for the Design for Service approach. Additionally, establishing trust and operating as a 'critical friend' is crucial in increasing the influence of design in the organisation. Her study represents a first in the application of the Design for Service approach in a VCS context and provides detailed evidence and insight into the capacity for transformational change using design. She has also developed a prototype 'design-readiness' self-assessment tool to help VCS organisations evaluate if design is right for them.

Mariana Amatullo is the Co-Founder and Vice President of Designmatters, the award-winning social impact department of Art Center College of Design in the USA. She is a practitioner-scholar involved in social innovation projects directly through her work at Designmatters and an example of a design practitioner who is using research to ground and enrich her practice. Her PhD, *Design Attitude and Social Innovation: Empirical Studies of the Return on Design* takes a different tack to current popular qualitative approaches in design research. Her study has sought to explain the phenomena of 'design for social innovation' in a broad context and to systematically address the question of "*how might we elucidate the value designers bring to the field of social innovation?*" Her analyses rely on original empirical evidence, collected and framed in a 'mixed methods' exploratory design sequence that combines elements of qualitative (grounded theory and ethnographic) and quantitative research approaches. Her study is also interdisciplinary – relating to our next point as it integrates theories of social innovation, organisational culture, institutional logics and design and eventually builds on the construct of 'design attitude' (Bolland and Collopy, 2004; Michlewski, 2008). Her theoretical contribution is a new framework that conceptualizes what she calls the 'return on design' (ROD) for social innovation.

4.2 Inter/multi/cross/trans/alter Disciplinary Studies

In the recent national assessment of research excellence in the UK (REF, 2014) that comprised all areas of design, including all forms of practice and the historical and theoretical study of design, the list of other disciplines that featured included medical and engineering science, computer technology, philosophy, history, anthropology, and ethnography. Similarly, a significant number of research outputs were of an interdisciplinary nature and were in the form of collaborative projects. A significant part of this interdisciplinary activity entails collaboration with disciplines such as media studies, literature, engineering, medicine and history. As is the case with new areas of inquiry, many of these studies have focused on exploring the professional culture, defining the range of activities, establishing measurements of value, identifying ethical issues and establishing

professional legitimacy within a wide range of context such as business, public sector, healthcare, voluntary community sector and government.

Thus, design now is well established in and across many new sectors and contexts (Marshall, 2008). Consequently, design research is increasingly an inter/multi/cross/trans/alter-disciplinary pursuit. Graham Pullin's PhD (2013a), combines speech, disability and design. It focuses on pioneering more expressive communication for people who cannot speak and currently find themselves limited by text-to-speech synthesis. His study, *17 ways to say Yes, exploring tone of voice in augmentative communication and designing new interactions with speech synthesis* explores an often overlooked issue of voice output communication aids with the "sensibilities and skills—of interaction design" (Pullin, 2013b, p.14). The activities of exploration and design practice were used to visualise tone of voice, in order to catalyse new conversations, through two original design research projects (Figure 1). Due to the subject matter, his research is not only relevant to design research but has made important contributions to the augmentative and alternative communication field through publications, projects and keynotes.



Figure 1. *Six Speaking Chairs* by Pullin and Cook (Photo: Andrew Cook).

4.3 New Ways of Looking at Old Things

As well as new topics of enquiry introduced in the previous section, we have observed new ways of exploring the more established topics of design research. For example, Anthony Forsyth's ongoing PhD study examines the poetic quality of design objects. His study is concerned with what Bayazit (2004) would call, "the physical embodiment of man-made things" and how they work. Rather than take a historical or critical approach to the research, Forsyth is using his practice as the platform for his investigation, informed by expert interviews and a contextual study. He is creating a series of new lighting objects to challenge and define his poetics framework (Figure 2).



Figure 2. Work-in-progress images depicting early, functional prototypes of Anthony Forsyth's "Flicker" lamp concept (Forsyth et al, 2015). "Flicker" is inspired by the play of candlelight on the surrounding environment and employs a wind sensor coupled to an Arduino board. With programming to modulate the effect, an LED array dims and brightens in response to air currents passing across the sensor.

Studies concerned with design as “construction as a human activity, how designers work, how they think, and how they carry out design activity” (Bayazit, 2004, p.16) can be argued as one of the earliest subjects of interest for design researchers. Early design researchers relied on a strong ‘positivistic’ philosophy, in which they worked on the premise that there is an objectively correct method for designing, which could be described by theoretical models (Holness, 2000). This was in part driven by researchers who were not trained as designers but rather from ‘other’ disciplines more at ease with this approach. However, with increasing researchers coming to research from a design background, the turn to more sympathetic and introspective way of researching is becoming increasingly common.

Phil Luscombe’s PhD thesis, *Making Things Up: Workshop Practice as a Place of Design*, considers workshop practice, specifically the production of three-dimensional wood, metal and plastic products, as a place of design (Figure 3). Luscombe’s exploration into the nature of tools, techniques and material engagement during the *making* of designs is based around a reflective, autobiographical account of the making process (Schön, 1983). A practitioner’s use of tools has been a key interest for design researchers for many years. Luscombe’s thesis builds on existing approaches of anthropological studies of productive work (Rosner, 2012; Ingold, 2011) and practice-based design research by investigating, both practically and theoretically, the tools (including hammers, saws, files, laser cutters and CNC milling machines) and techniques of workshop practice.

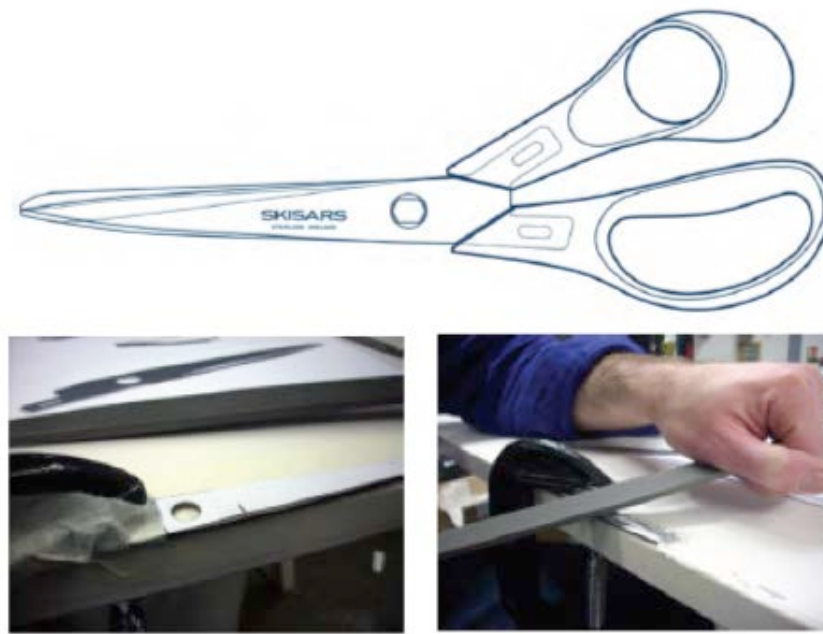


Figure 3. *Making Scissors* (Luscombe et al., 2013).

The aim of Luscombe's PhD research is to explore how design practitioners might *think about*, and subsequently *think through*, the process of making. Drawing on sources from the fields of anthropology, archaeology, craft and philosophy, the research explores theoretical understandings of the process of making and posits that the act of making is best understood not as an attempt to realise a pre-existing design, but as an improvisatory engagement with tools and materials – an act of discovery rather than transcription. The research presents a collection of concepts that allow contemporary designing and making practice to be interrogated in novel ways, offering new insights into: the relationship between designing and making; the epistemic potential of workshop processes; a practitioner's engagement with tools and materials; and the nature of workmanship.

4.4 A New Criticality and Responsibility

The social potential of design has become a key research concern due to new applications of design within the strategy, social and policy space. Design is no longer just about the orchestration of material, but increasingly about the manipulation of people and other vital resources. Human behaviour as the object of design is the focus of Ben Singleton's PhD (2014) in which he explores how designers might approach human behaviour as a material to be worked on. He was critical of the lack of debate and discussions on what he saw as a potent potential of design to 'design' human behaviour, especially pertinent in light of the emergence of service design as now an established design discipline. This questioning of the role and ethics of design is really important if design is to flourish and gain professional legitimacy in other disciplines. There is a sense that if design wants to 'play' in these new social spaces, it has to learn to understand and be responsible for its impact.

The research of Daniel Carey provisionally entitled *Developing and Delivering Innovative Disruptive Design Interventions in Health and Social Care* involves exploring the potential of design disruption within the context of informal health and social care. Carey's ongoing Arts and Humanities Research Council (AHRC) funded PhD research in collaboration with Newcastle Carers seeks to map and understand better the experiences of people caring for people living with dementia (Figure 4).

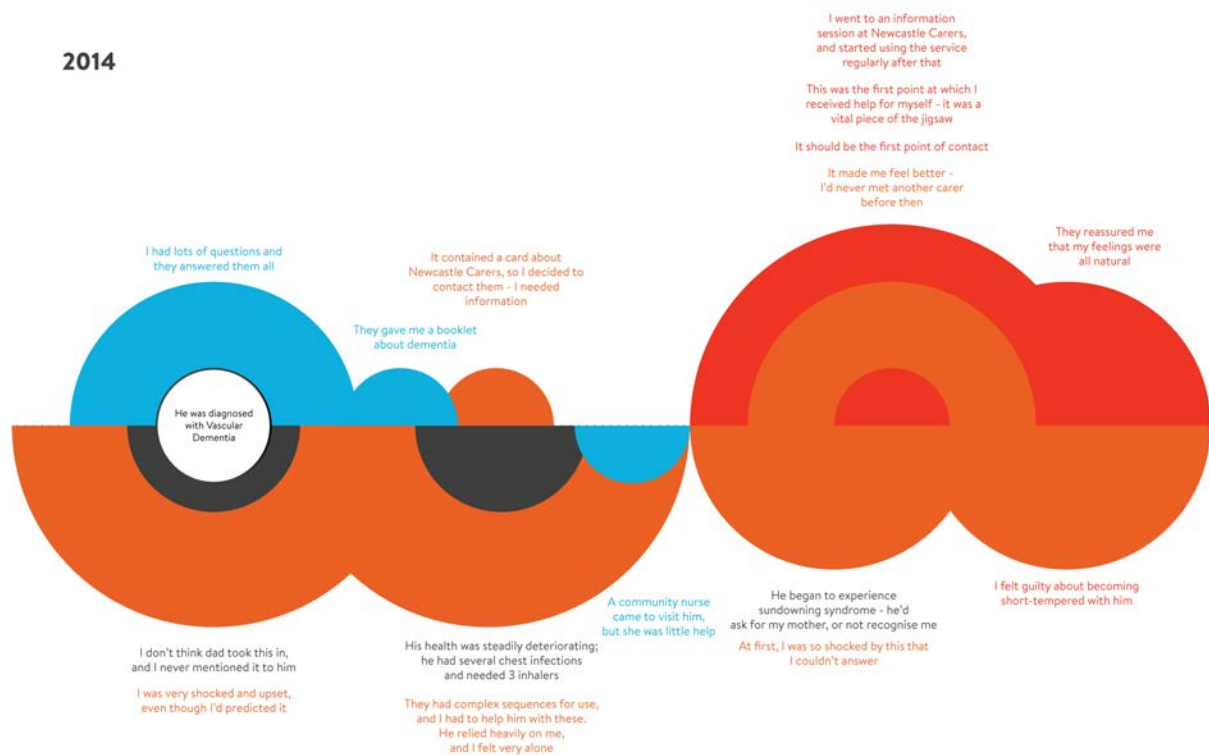


Figure 4. A Small Part of a Carer's Journey.

The aim is to identify and define the interactions between informal carers and governmental and charitable support organisations, their perception of the services available to them, and other informal methods employed to cope with the caring role. Carey's maps offer a valuable new way of visualising the complex interrelationships between support organisations, and they highlight a number of significant problems faced by informal carers and their families.

4.5 More 'Messiness' on Show

Design research can be messy and complex without comprising rigour. This acknowledgement of complexity and messiness in a research project is especially important in research studies focused on understanding how design influences and impacts on people's behaviour. This awareness is evident in a number of ways. Firstly, the research

methodology used in many recent Design PhDs have been focused on allowing new ideas to emerge through the use of an abductive approach to researching. Abduction, compared with deduction and induction is a process of forming explanatory hypothesis through linking ideas together when there is no clear hypothesis or principle available. As the ‘what if’ questions are becoming more common in design research, it makes sense to see a growing use of abduction in research projects. As abduction has been closely linked to the activities of designing (Kolko, 2010; Dorst, 2015), it is unsurprising that abduction would work just as well for design research.

Abductive reasoning may not be ‘true’ but produces insights and ideas that are plausible (enough) but provisional to help move a project forward (Kimbrell, 2015). These insights require further exploration and elaboration before the switch to more traditional inductive or deductive reasoning at the latter stages of the research. For that reason, there is usually an exploratory phase in the research design to explore a number of possible research directions based on the initial research questions. For example in Michael Leitner’s 2014 PhD on mobile interaction trajectories, he framed his first research stage using Binder and Redström’s programme and experiment approach (2006) and explained that each programme (stage) acts as a conjecture, rather than a hypothesis (Figure 5). This open and exploratory research design offered him a flexibility in the way he approached his next research stages and subsequently helped direct his two design experiments.

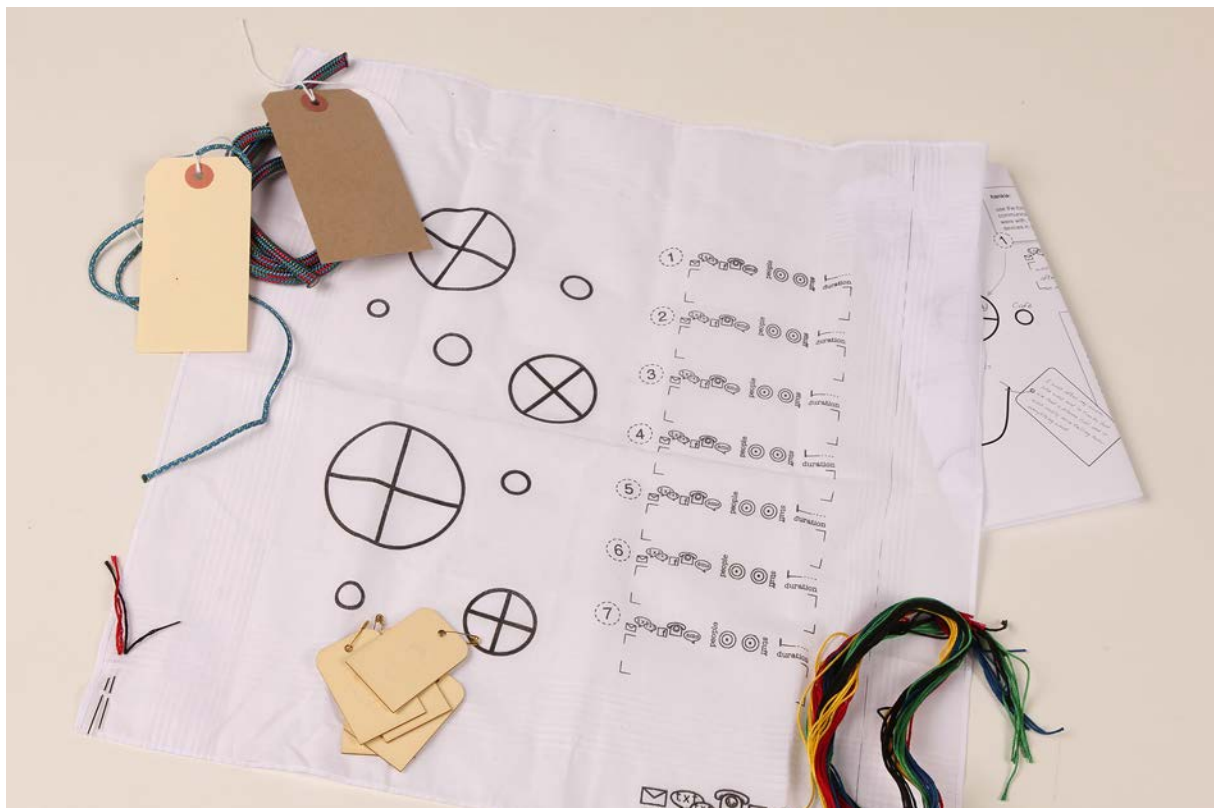


Figure 5. Micheal Leitner's Hanky Probe package created to study mobile relationships.

Messiness in research tends to be ‘swept under the carpet’ and cleaned up through the rationalization process of writing. As a result, the nuances and intricacies of the research activities and decisions often get lost in the final reporting of the research. Pullin (2013b, p.5) attempted to address this problem by creating a guide to his thesis framed as ‘navigational notes’. He states that while a strong narrative thread is established through a more traditional thesis format, the “interwoven navigational notes provide a means to capture important complexities that might have been lost.... free to act as reflections on the main text, the navigational notes are an opportunity to be more transparent—and more honest—about what happened and when.”

4.6 Social Dimension and Context

Design researchers are increasingly recognizing the importance of individuality and context in their research approach. Many questions asked in design research cannot be simply answered with a binary yes/no or true/false answer and instead sit on a continuum of interpretations that will change based on any given context. Tommy Dykes’ PhD is focused on understanding how design might improve day-care facilities for the elderly. He has created a number of evocative and thoughtful interaction objects that aims to foster conversation and curiosity (Figure 6). Dykes chose to create objects that allowed open-ended and playful interactions between people. Dykes’ research highlights the bias of always using focused problem solving approach, since it can often lead to products that represent a very narrow range of experiences and usage. Instead, he chose to make objects that help make life richer instead of easier.



Figure 6. ‘PhotoScrabbler’ (Dykes, 2014) is a prototype that slowly transitions and gently fades in a slideshow of Flickr images that change to reflect the words created with wooden Scrabble tiles on a letter holder. It was designed as a way of bringing joy of exploring Flickr to small groups of people living with dementia in an Adult Day Centre.

Lizette Reitsma's PhD (2015), *Dynamics of Respectful Design in Co-creative and Co-reflective Encounters with Indigenous Communities*, deals with the often-problematic area of designing with indigenous communities. Because of design's overarching aim to 'improve' things many design approaches are often guilty of 'colonising'. Reitsma's research has explored ways to deal with such concerns. Adopting a 'Respectful Design' approach that seeks to ensure that the indigenous community benefits from design projects, Reitsma has developed a framework so that the designer has space for dialogue to guarantee such benefits (Figure 7). Reitsma's co-creative and co-reflective encounters with indigenous communities have led to a model of "respectful design space" and recommendations on how to reach such a space.

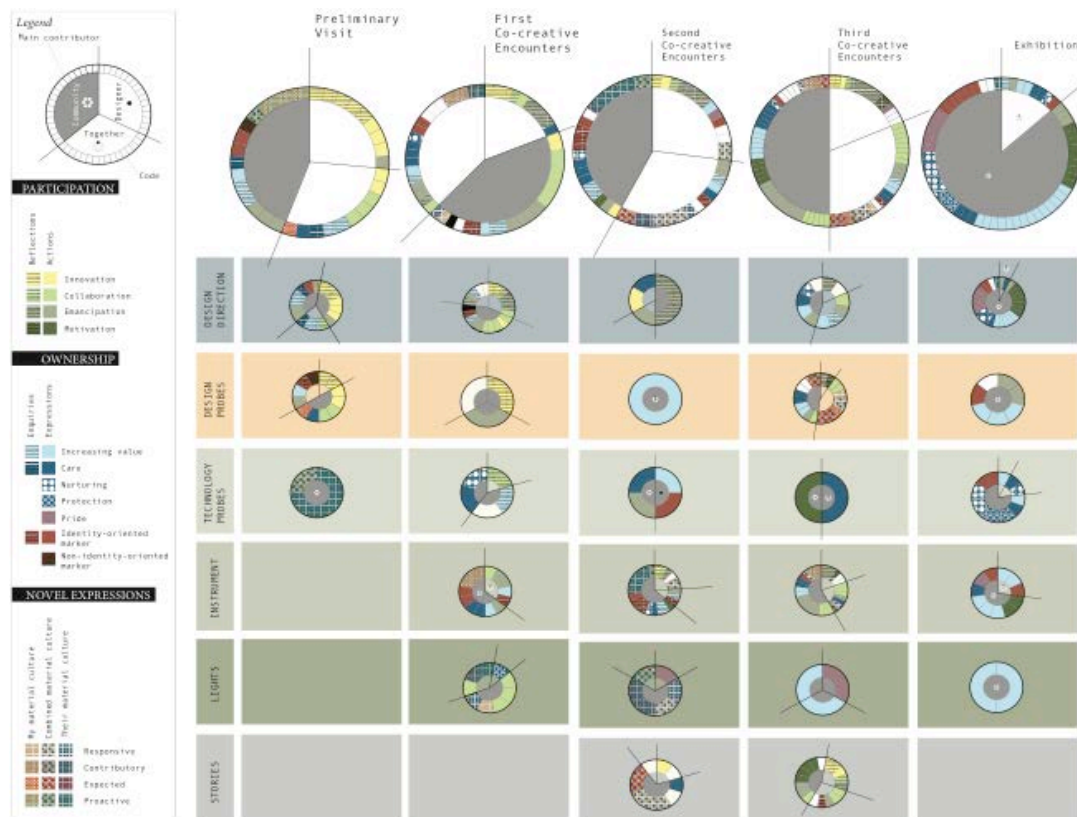


Figure 7. Analysis tool to explore "Respectful Design" (Reitsma, 2015).

4.7 Different Ways to Communicate Research

With the growing practice of using design as a vehicle of research, an area that is in constant debate is how to document the realities of practice-based research more analogously. Whilst the traditional conference paper, journal or essay format is still the dominant format of dissemination, more multi-layered and dialogical forms are being proposed and trialled by a number of different researchers. For example, in the interdisciplinary field of Human-Computer Interaction (HCI) (Gaver, 2011; Gaver, 2012) and Bowers (2012) have articulated strategies for communicating practice-based research that privileges provisional and contingent expressions through the creation of 'annotated portfolios' and 'workbooks'. This shift to practice has also been recognised by academic conferences (e.g. Research Through

Design, Making Futures, All Makers Now, PhD by Design) that offer a more synergistic platform to support and encourage experimentation, interdisciplinarity and visual argumentations.

There are also a number of doctoral studies that challenge the current convention of research communication. For example, Daria Loi's doctoral thesis (2004) was presented in the form of a suitcase. Her research was focused on exploring ways to foster organisational spaces where collaborative activities can be undertaken using design tools and methods. The thesis was presented as a suitcase containing participatory devices to enable readers to have a discourse with the thesis, while at the same time actively demonstrating some of the concepts that the thesis discusses. In a more recent example, Nick Sousanis submitted a doctoral dissertation in a graphic form titled 'Unflattening' (Figure 8). Sousanis' 'Unflattening' concept relates to "multimodality, about interdisciplinarity, about image-text, that is both public and scholarly. It's saying that we need to dimensionalize the kinds of conversations we have rather than coming at them head-on" (Sousanis, 2015). Considering the subject matter, it made sense for Sousanis to represent and communicate this concept through the multi-modal form of a graphic novel. While there is current debate (as seen on the PhD-Design List email archive) as to whether the graphic form sufficiently demonstrates and evidence a method of scholarly, scientific or professional analysis, it is nonetheless an interesting example that challenges our perception on accepted modes of design research communication.

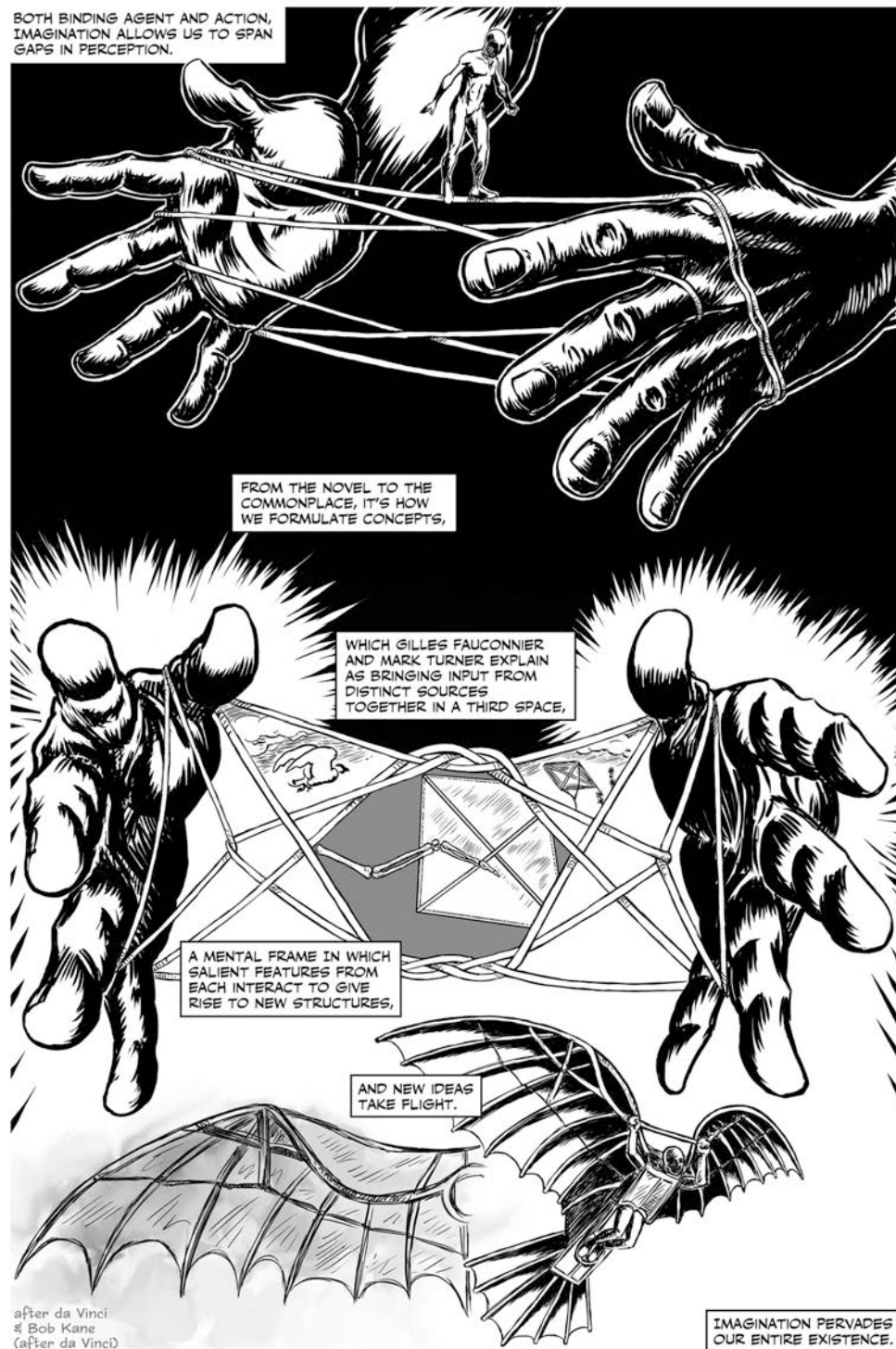


Figure 8. Excerpt from Nick Sousanis' 'Unflattening' PhD thesis, page 91 (2015).

Design research is also increasingly presented, discussed and influenced through a co-design and participatory process. Cobb's design research project entitled *The 100-Mile Suit*

explored regional supply chains with the aim of reintegrating and reconnecting the wearer of clothes to local trades and economies (Cobb, 2015). Cobb's research intends to introduce a dialogue about resources and community in an attempt to unravel disconnect between consumer and producer. Cobb's project was disseminated as part of a museum exhibition focusing on local communities and collective gestures where a regional garment supply chain was simulated so that the community could witness the process of making clothing, talk to the makers and touch the materials (Figure 9).



Figure 9. 100-Mile Suit – Materials, Exhibition Shot, Detail (Cobb, 2015).

This range of research dissemination format is also reflected in the range of outputs submitted in national research assessment exercises. For instance, the UK's Research

Excellence Framework (REF) of 2014 recorded over 20 forms of output submitted. The UK REF (2014) for Art and Design: History, Practice and Theory, one of the largest sectors in the exercise, reported on the: “...range, energy and vitality of the submissions it received.” Adding that: “...over 60 per cent of the submitted work was considered to be world-leading or internationally excellent” and that “...this quality of work was found across the discipline range, and at all career stages of submitted staff.” (Figure 10). The REF (2014) also found that design research “...has been a pioneer and supporter of practice-based research through previous RAEs, and the increasing quantity and quality of practice-based research in REF2014 confirms that the sector is a leader in this mode of research activity.” Much of this focus has “...produced a large quantity of high-calibre research outputs.” These are most notably in “...digital design; design and the business process; product modelling; transport design; and health.” REF (2014) also noted that much of this activity is undertaken with small and medium-sized enterprises (SMEs) and larger-scale industrial producers, and collaboration across other organisations and institutions. It is acknowledged, however, that not all countries allow the range of submission types accepted by the UK's REF exercise.

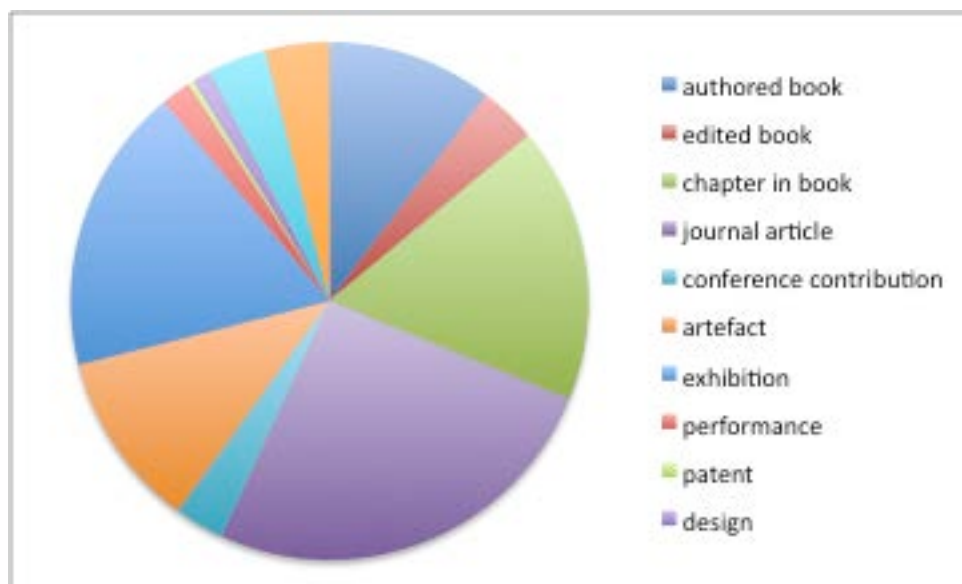


Figure 10. Research Output Types in Art and Design: History, Practice and Theory REF 2014 Submission.

5. Ten Characteristics of ‘Good’ Design Research

This paper has highlighted that design research is alive and kicking and residing in a number of places by examining recent design PhDs drawn from the UK and USA. We began by contextualising current developments of design research in relation to its past and have reflected on and highlighted emerging trends in how design research is practiced, discussed and communicated. We now conclude by summarising these trends into ‘characteristics’ of design research.

Design research is not only alive and kicking, it continually challenges research conventions. The plurality in emerging forms of design research is clearly evident in the wide range of conceptual, methodological, technological and theoretical approaches. Furthermore, many forms of design research regularly appear in a vast array of cognate disciplines, including business, engineering, computing, healthcare and management and many techniques and approaches from those disciplines are often altered and exploited in design pursuits such as Graham Pullin's PhD (Pullin, 2013a).

We maintain that design research that purposely blurs distinctions and has challenged existing academic models, from being disciplined to being irresponsible, will be best placed to make connections that generate new ways to identify 'other' dimensions of design research, activity and thought that is needed for the complex, interdependent issues we now face (Rodgers and Bremner, 2011). Moreover, developments in digital technologies have dramatically modified extant models of design thought and action, and design research must now transform itself from a convention domesticated by the academy (disciplined) to a reaction to globalisation that is yet to be disciplined. In these conditions we introduce 10 characteristics of design research (Figure 11), based loosely on Dieter Rams' 10 principles of good design, (Klemp and Ueki-Polet, 2010) that not only represent the variety of current design research but can also act as a reference point moving forward.

Table 1. Ten Characteristics of 'Good' Design Research (based on Dieter Ram's 10 Principles of Good Design).

<i>Dieter Ram's 10 Principles of Good Design</i>	<i>Rodgers and Yee's 10 Characteristics of Good Design Research</i>
<i>Good design:</i>	<i>Good design research:</i>
<i>is innovative</i>	<i>is disruptive</i>
<i>makes a product useful</i>	<i>is useful</i>
<i>is aesthetic</i>	<i>is messy</i>
<i>makes a product understandable</i>	<i>is political</i>
<i>is unobtrusive</i>	<i>is impactful</i>
<i>is honest</i>	<i>is critical</i>
<i>is long-lasting</i>	<i>is enduring</i>
<i>is thorough down to the last detail</i>	<i>does not need qualification</i>
<i>is environmentally friendly</i>	<i>is thoughtful</i>
<i>is as little design as possible</i>	<i>is clear</i>

These characteristics should not be used to 'label' or 'qualify' different types of design research and in this respect, the authors agree with the tenet in Cameron Tonkinwise's recent essay entitled *Just Design: Being Dogmatic about Defining Speculative Critical Design Future Fiction* when he says:

"Every time you qualify design with, or add design to, some other quality or practice, you are claiming that design does not already do that. All these phrases are redundant and/or appropriative of design: Design Futures, Design Fiction, Speculative Design, Critical Design, Adversarial Design, Discursive Design, Interrogative Design, Design Probes, Ludic Design. Designing that does not already Future, Fiction, Speculate, Criticize, Provoke, Discourse, Interrogate, Probe, Play, is inadequate designing."

"Thinking that these need to be added to design reinforces the mistaken belief that design is just an instrumental technical task – styling. These qualifiers are precisely what allows (commercial) designing to not (have to) do all those things, or, ironically, constrains (commercial) designing from doing all those things. Calling out all these specialist versions of designing benefits only the artificial ecosystems of academic design research, especially the bubble that is HCI." (Tonkinwise, 2015).

6. Conclusions

This paper puts forward 10 characteristics of 'good' design research, based loosely on Dieter Rams' 10 principles of good design, that not only represent the variety in current design research pursuits but can also act as a reference point for the next 50 years. To move towards achieving relevant, valuable, and responsive research in an uncertain era, this paper posits that design research needs to be:

1. **Disruptive** – Design is very good at offering new ways to view the world through alternative futures. In this respect, good design research should disrupt the status quo and offer new perspectives.
2. **Useful** – Research is practiced in order to be useful. It must serve a defined purpose. However, the most important task of design research is to optimise the utility of its own usefulness (Rodgers and Bremner, 2011).
3. **Messy** – Good design research makes you think, it makes you question and because it is not clear-cut, it is inherently messy. Messiness does not negate the fact that research still has to be rigorous but that it requires untangling using approaches that do not over-simplify nor merely seek to reduce.
4. **Political** – Design research needs to acknowledge its political dimensions and direction. Design research must now respond to new globalised perceptions and clarify its stance on the world's significant challenges – poverty, mass migration, ageing, isolation, conflict, security, and many others.
5. **Impactful** – The regular (every 4 or 5 years) United Kingdom Research Excellence Framework (REF) national assessment of the quality of research in UK higher education institutions, assesses the impact of research outside of academia and is defined as: "...an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of

life, beyond academia.” Thus, design research should consider how it will contribute to having impact in one or more of the following walks of life – *Civil society* (including in regional and local contexts), *Cultural life*, *Economic prosperity*, *Education*, *Policy making*, *Public discourse*, and *Public services*.

6. **Critical** – Design now starts from a globalised state of culture, so contemporary forms of design research must not only comprise an understanding of historical, cultural, and social perspectives but also be critical and challenging of these perspectives.
7. **Enduring** – Design research should avoid the trap of only focusing on current ‘hot’ topics. Well-structured design research should reflect a profound evolution in our vision of the world and our way of inhabiting it.
8. **Does not need qualification** – There is less need to define particular types of design as ‘practice-based’ or ‘research-through’ or ‘research-into’ and so on. The importance of design research now lies in its rigour, relevance, quality (questions asked, methodology, results), and impact. Distinction between ‘research-through’, ‘research for’, ‘research-into’, etc. should no longer be used to defend a particular way of doing design research.
9. **Thoughtful** – Design research must be serious about what it is doing as design looks to address difficult issues which includes “...*economy as well as ecology, with traffic and communication, with products and services, with technology and innovation, with culture and civilization, with sociological, psychological, medical, physical, environmental, and political issues, and with all forms of social organization.*” (Rams et al., 1991).
10. **Clear** – Design research should bring clarity to the processes, activities, meanings, roles, value etc. of design. At best, design research is self-explanatory.

These 10 characteristics of ‘good’ design research will support design researchers in framing and addressing the complex global issues we now face. It will help ensure that emerging forms of design research play a major creative and transformative role in shaping our future living in more responsible, sustainable, meaningful, and valuable ways.

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